Plant, Cell and Environment (1988) **11**

Contents

PART 1

i Editorial
1 The accumulation and storage of nitrogen by herbaceous plants: opinion
P. Millard
9 Role of nitrate in regulating germination of *Sinapis arvensis* L. (wild mustard)
J. Stephen Goudey, H. S. Saini & M. S. Spencer
13 The influence of water deficits on needle conductance, assimilation rate and abscisic acid concentration of seedlings of *Pinus radiata* D. Don
R. O. Squire, T. F. Neales, B. R. Loveys & P. M. Attiwill
21 Ion currents associated with root tips, emerging laterals and induced wound sites in *Nicotiana tabacum*: spatial relationship proposed between resulting electrical fields and phytophthoran zoospore infection
A. L. Miller, E. Shand & N. A. R. Gow
27 A two-way gas transport system in *Nelumbo nucifera*
J. Mevi-Schutz & W. Grosse
35 A method for measuring hydraulic conductivity and embolism in xylem
J. S. Sperry, J. R. Donnelly & M. T. Tyree
41 Mechanical freeze-thaw damage and frost hardening in leaves and isolated thylakoids from spinach. I. Mechanical freeze-thaw damage in an artificial stroma medium
D. K. Hincha & J. M. Schmitt
47 Mechanical freeze-thaw damage and frost hardening in leaves and isolated thylakoids from spinach. II. Frost hardening reduces solute permeability and increases extensibility of thylakoid membranes
D. K. Hincha & J. M. Schmitt
51 Differences between the effects of partial and whole plant chilling on carbon translocation of a C_4 grass
C. Potvin
55 Ecophysiological investigations of *Chara vulgaris* L. grown in a brackish water lake: ionic changes and accumulation of sucrose in the vacuolar sap during sexual reproduction
G. O. Kirst, M. I. B. Janssen & U. Winter
63 Book reviews

PART 2

67 Opinion: In defence of the cell volumetric elastic modulus
D J. Cosgrove
71 Changes in sodium and potassium in *Nitellopsis* cells treated with salt stress
M. Katsuhara & M. Tazawa
75 The effects of continuous illumination on the function and structure of *Micrasterias torreyi* Bail (Conjugatophyceae)
J. Lehtonen, P. Vuorio & J. Mäki
83 The effect of pH on stomatal sensitivity to abscisic acid
N. W. Paterson, J. D. B. Weyers & R. A. Brook
91 The influence of CO_2 enrichment, phosphorus deficiency and water stress on the growth, conductance and water use of *Pinus radiata* D. Don
Jann P. Conroy, M. Küppers, B. Küppers, J. Virgona & E. W. R. Barlow
99 Comparative ultrastructural properties of pallisade tissue and spongy tissue chloroplasts from normal and mutant leaves of *Pisum sativum* L.
H. P. Schwarz
111 Observed and modelled stomatal responses to dynamic light environments in the shade plant *Alocasia macrorrhiza*
M. U. F. Kirschbaum, L. J. Gross & R. W. Pearcy
123 Rhodamine 123 as a vital stain for mitochondria of plant cells
G. L. Vannini, S. Pancaldi, F. Poli & M. P. Fasulo
129 The citrus leaf cuticle in relation to measurement of leaf water potential using thermocouple psychrometers
D. M. Oosterhuis, M. L. Parker, S. D. Wullschleger & K. S. Kim
137 The compatibility of osmotica in cyanobacteria
S. R. C. Warr, R. H. Reed & W. D. P. Stewart
143 Mechanism of detecting light direction in first positive phototropism in *Zea mays* L.
C. J. Piening & K. L. Poff
147 Book reviews

PART 3

149 Response of wheat seedlings to short-term drought stress with particular respect to nitrate utilization
A. Talouizite & M. L. Champigny
157 Cell age-related differences in the interaction of a potential-sensitive fluorescent dye with

nuclear envelopes of *Acetabularia mediterranea*
M. A. Matzke, A. J. M. Matzke & G. Neuhaus
165 Characterization of the effects of metabolic inhibitors, ATPase inhibitors and a potassium-channel blocker on stomatal opening and closing in isolated epidermis of *Commelina communis* L.
P. E. Karlsson & A. Schwartz
173 Comparisons of photosynthesis and photoinhibition in the CAM vine *Hoya australis* and several C_3 vines growing on the coast of eastern Australia
W. W. Adams III, I. Terashima, E. Brugnoli & B. Demmig
183 Curve fitting of germination data using the Richards function
G. J. Berry, R. J. Cawood & R. G. Flood
189 Effects of ethylene and some other environmental factors on different stages of germination in redroot pigweed (*Amaranthus retroflexus* L.) seeds
M. W. Schonbeck & G. H. Egley
199 Field measurement of leaf water potential with a temperature-corrected *in situ* thermocouple psychrometer
S. D. Wullschleger, M. A. Dixon & D. M. Oosterhuis
205 Effects of boundary layer conductance on substomatal pressures of carbon dioxide
J. A. Bunce
209 Book reviews

PART 4

211 A quantitative approach to the inorganic carbon system in aqueous media used in biological research: dilute solutions isolated from the atmosphere: review
R. J. Helder
231 Effects of frost hardening, dehardening and freezing stress on *in vivo* chlorophyll fluorescence of seedlings of Scots pine (*Pinus sylvestri* L.)
M. Strand & G. Öquist
239 Stomatal limitation of photosynthesis and reduced growth of the halophyte, *Plantago maritima* L., at high salinity
L. B. Flanagan & R. L. Jefferies
247 Persistent xylem cross-walls reduce the axial hydraulic conductivity in the apical 20 cm of barley seminal root axes: implications for the driving force for water movement
J. Sanderson, Fiona C. Whitbread & D. T. Clarkson
257 Light and chlorophyll gradients within *Cucurbita* cotyledons
A. K. Knapp, T. C. Vogelmann, T. M. McClean & W. K. Smith
265 Inhibition of expression of tomato-ripening genes at high temperature
S. Picton & D. Grierson
273 Light and electron microscope studies on pollen development in barley (*Hordeum vulgare* L.) grown under copper-sufficient and deficient conditions
A. W. Jewell, B. G. Murray & B. J. Alloway
283 Effect of high external NaCl concentrations on ion transport within the shoot of *Lupinus albus*. I. Ions in the xylem sap
Rana Munns
291 Effect of high external NaCl concentration on ion transport within the shoot of *Lupinus albus*. II. Ions in phloem sap
Rana Munns, M. Lorraine Tonnet, Carol Shennan & P. Anne Gardner
301 Book reviews

PART 5

303 Introduction: Molecular approaches to environmental physiology
D. Grierson
305 Molecular biology of phytochrome
J. T. Colbert
319 Photoregulation: diverse gene responses in greening seedlings
W. F. Thompson
329 Photocontrol of plastid gene expression
G. Link
339 Genetic engineering strategies for manipulation of the heat shock response
F. Schöffl
345 Molecular biology of wound-inducible proteinase inhibitors in plants
C. A. Ryan & G. An
351 Genetic and molecular approaches to the study of the anaerobic response and tissue specific gene expression in maize
J. Bailey-Serres, B. Kloeckener-Gruissem & M. Freeling
359 A role for haemoglobin in all plant roots?
C. A. Appleby, D. Bogusz, E. S. Dennis & J. W. Peacock
369 Molecular approaches to the analysis of nitrate assimilation
J. L. Wray
383 Molecular biology of metal tolerances of plants
A. B. Tomsett & D. A. Thurman
395 Elicitors and defence gene activation
M. D. Templeton & C. J. Lamb
403 Nodulation of legumes by *rhizobium*
J. A. Downie & A. W. B. Johnston
413 Plant regulated aspects of nodulation and N_2 fixation
C. P. Vance, M. A. Egli, S. M. Griffith & S. S. Miller

PART 6

429 Opinion: Some thoughts about the use of predicted values of the state of phytochrome in plant photomorphogenesis research
A. L. Mancinelli

441 Opinion: The heat-shock response in higher plants: a biochemical model
J. J. Burke & K. A. Orzech

445 Day-night changes of citric-acid levels in crassulacean acid metabolism: phenomenon and ecophysiological significance
U. Lüttge

453 Water-use efficiency in rice (*Oryza sativa* L.) in relation to resistance to salinity
T. J. Flowers, F. M. Salama & A. R. Yeo

461 The effect of divalent cations on Na^+ tolerance in Charophytes. I: *Chara buckellii*
R. Hoffman & M. A. Bisson

473 The effect of divalent cations on Na^+ tolerance in Charophytes. II: *Chara corillina*
J. A. M. Tufariello, R. Hoffman & M. A. Bisson

481 The roles of low temperature and light in accumulation of a 31-kDa polypeptide in the light-harvesting apparatus of maize leaves
P. S. Covello, D. B. Hayden & N. R. Baker

487 Site-directed monoclonal antibodies against the amino-terminus of 124-kDa phytochrome from *Avena sativa* L.
C. Plumpton, M. D. Partis, B. Thomas, N. S. Huskisson & G. W. Butcher

493 Nitrogen-stimulated potassium influx into maize roots: differential response of components resistant and sensitive to ambient ammonium
F. R. Vale, W. A. Jackson & R. J. Volk

501 Regulation of protein synthesis in root, shoot and embryonic tissues of germinating barley during salinity stress
S. Ramagopal

517 Mediation of high-temperature injury by roots and shoots during reproductive growth of wheat
T. Kuroyanagi & G. M. Paulsen

525 Anomalous kinetics of sucrose uptake in maize scutellum slices
T. E. Humphreys

535 Compartmentation and fluxes of carbon in leaf blades and leaf sheaths of *Poa annua* L. and *Poa x jemtlandica* (Almq.) Richt
A. M. Borland & J. F. Farrar

547 Blue light-regulation of cell division in *Adiantum* protonemata: an approach with pulse stimulation
M. Iino, Y. Nakagawa & M. Wada

555 Blue light-regulation of cell division in *Adiantum* protonemata: kinetic properties of the photosystem
M. Iino, Y. Nakagawa & M. Wada

563 Book reviews

PART 7

565 Opinion: Changing concepts regarding plant water relations
P. J. Kramer

569 Response to Dr P. J. Kramer's article, 'Changing concepts regarding plant water relations', Volume 11, Number 7, pp. 565–568
J. B. Passioura

573 Response to Dr P. J. Kramer's article, 'Changing concepts regarding plant water relations', Volume 11, Number 7, pp. 565–568
E.-D. Schulze, E. Steudle, T. Gollan & U. Schurr

577 Stomatal and non-stomatal limitations to carbon assimilation: an evaluation of the path-dependent method
S. M. Assmann

583 Water economy and photosynthesis of the CAM plant *Senecio medley-woodii* during increasing drought
B. R. Ruess, S. Ferrari & B. M. Eller

591 Photosynthetic responses of two heliotropic legumes from contrasting habitats
J. M. Prichard & I. N. Forseth

603 Carbon balance during CAM: an assessment of respiratory CO_2 recycling in the epiphytic bromeliads *Aechmea nudicaulis* and *Aechmea fendleri*
H. Griffiths

613 Ideal nutrient productivities and nutrient proportions in plant growth
G. T. Ågren

621 Early bending kinetics in response to geostimulation or unilateral IAA application in *Lolium* nodal segments
P. E. Clifford

629 An artificial osmotic cell: a model system for simulating osmotic processes and for studying phenomena of negative pressure in plants
E. Steudle & H. Heydt

639 Movement of lucifer yellow in leaves of *Coleus blumei* Benth
D. G. Fisher

645 Different forms of phototropic response induced by microbeam irradiation of discrete regions of an organ
A. Taylor, J. W. Hart & A. R. Berg

653 Control of hypocotyl phototropism by phytochrome in a dicotyledonous seedling (*Sesamum indicum* L.)
F. Woitzik & H. Mohr

663 Control of hypocotyl gravitropism by photochrome in a dicotyledonous seedling (*Sesamum indicum* L.)
F. Woitzik & H. Mohr

PART 8

669 Plant coated vesicles: review
J. Coleman, D. Evans & C. Hawes

685 Recovery of photosynthesis from water stress in *Eucalyptus pauciflora* — a process in two stages
M. U. F. Kirschbaum

695 Effects of temperature and oxygen depletion on metabolic rates of tomato and carrot cell cultures and cuttings measured by calorimetry
R. S. Criddle, R. W. Breidenbach, E. A. Lewis, D. J. Eatough & L. D. Hansen

703 Ice formation and tissue response in apple twigs
E. N. Ashworth, P. Echlin, R. S. Pearce & T. L. Hayes

711 Heat shock and the protection against metal toxicity in wheat leaves
K. A. Orzech & J. J. Burke

715 The isolation of leaf protoplasts from the submerged aquatic angiosperm *Potamogeton lucens* L.
M. Staal, H. B. A. Prins, M. van Harmelen & R. J. Helder

721 Nitrogen fixation by three species of *leguminosae* in the Canadian High Arctic Tundra
H. M. Schulman, M. C. Lewis, E. M. Tipping & L. M. Bordeleau

729 Silver ions inhibit the ethylene-stimulated production of ripening related mRNAs in tomato
K. M. Davies, G. E. Hobson & D. Grierson

739 The wilty tomato mutants *flacca* and *sitiens* are impaired in the oxidation of ABA-aldehyde to ABA
I. B. Taylor, R. S. T. Linforth, R. J. Al-Naieb, W. R. Bowman & B. A. Marples

747 Hormonal regulation of barley nuclease: investigation using a monoclonal antibody
P. H. Brown, R. P. Meacham & T.-H. David Ho

755 The nitrogen balance of *Raphanus sativus* × *raphanistrum* plants. II. Growth, nitrogen redistribution and photosynthesis under NO_3^- deprivation
G. W. Koch, E.-D. Schulze, F. Percival, H. A. Mooney & C. Chu

769 Enhancement of ABA responsiveness in wheat embryos by high temperature
M. Walker-Simmons

777 Analysing partitioning of recently fixed and of reserve carbon in reproductive *Phaseolus vulgaris* L. plants
D. R. Geiger & Wen-Jang Shieh

785 Variation in response of five identical steasy-state porometers: technical report
P. B. Reich, M. B. Walters & T. J. Tabone

787 Book review

PART 9

789 A mechanistic model for photosynthesis based on the multisubstrate ordered reaction of ribulose 1,5 bisphosphate carboxylase
H. Farazdaghi & G. E. Edwards

799 A model for photosynthesis and photorespiration in C_3 plants based on the biochemistry and stoichiometry of the pathways
H. Farazdaghi & G. E. Edwards

811 Seasonal patterns of water relations and enzyme activity of the facultative CAM plant *Portulacaria afra* (L.) Jacq.
L. J. Guarlnick & I. P. Ting

819 Isolation of nuclear shells from plant cells
Z. I. Galcheva-Gargova, E. I. Marinova & S. T. Koleva

827 Modelling of the responses to nitrogen availability of two *Plantago* species grown at a range of exponential nutrient addition rates
T. Hirose, A. H. Freijsen & H. Lambers

835 Sensitivity of soybean leaf development to water deficits
H. C. Randall & T. R. Sinclair

841 Ecophysiology of fire-stimulated seed germination in *Cistus incanus* ssp. *creticus* (L.) Heywood and *C. salvifolius* L.
C. A. Thanos & K. Georghiou

851 The use of positron emission tomography for studies of long-distance transport in plants: uptake and transport of ^{18}F
R. M. L. McKay, G. R. Palmer, X. P. Ma, D. B. Layzell & B. T. A. McKee

863 Continuous flow rhizostat for the study of aluminium toxicity
P. Brassard, J. R. Kramer, P. Nosko & A. Kershaw

875 Instructions to contributors